REMARKS

By the present amendment, independent claims 76, 84, 100 and 101 have been amended, and no claims have been added or cancelled. Accordingly, claims 1 – 101 are presently pending, and favorable consideration thereof is respectfully requested. Claims 1, 24, 55, 74 - 76, 84, 92, 100 and 101 are the independent claims. In addition, page 2 of the disclosure has been amended to correct a minor editorial error.

Applicant wishes to thank the Examiner for the careful review of the present application and of the prior art. Applicant also wishes to thank the Examiner for the acceptance of the formal drawings as originally filed.

35 U.S.C. § 102(e)

The Examiner has expressed the view that claims 1-10, 23-33, 46-62, 69-73, 74-75, 76-79, 83-87, 91-95, 99, 100 and 101 are anticipated by U.S. Patent No. 6,484,830 to Gruenwald et al. ("Gruenwald").

Applicant respectfully submits that the Gruenwald reference fails to satisfy the requirements for a finding of anticipation of claim 1. In this regard, the standard for an anticipation rejection under 35 U.S.C. §102 has been well established by the Court of Appeals for the Federal Circuit, and is summarized in M.P.E.P. § 2131:

> "A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California,* 2 U.S.P.Q. 2d 1051, 1053 (Fed. Cir. 1987). ... "The identical invention must be shown in as complete detail as is contained in the ... claim." *Richardson v. Suzuki Motor Co.,* 9 U.S.P.Q. 2d 1913, 1920 (Fed. Cir. 1989). The elements must be arranged as required by the claim, but this is not an *ipsissimis verbis* test, i.e., identity of terminology is not required. *In re Bond,* 15 U.S.P.Q. 2d 1566, 1567 (Fed. Cir. 1990).

Independent claim 1 recites:

1. A method of supplying energy to an energy bus in communication with an energy generating device and with a regenerative braking system in a hybrid electric vehicle, the method comprising controlling power supplied by the energy generating device to the energy bus, in response to a braking signal indicative of user brake actuation.

As discussed at various locations in applicant's specification, controlling power supplied by the energy generating device "in response to a braking signal indicative of user brake actuation" as recited in claim 1 is advantageous over prior art systems, which tend to control the power in response to detection of an over-voltage condition that has already resulted from the commencement of the regenerative braking. In this regard, during an abrupt transition from acceleration to regenerative braking, the latter prior art systems tend to permit at least a brief over-voltage spike before the over-voltage condition has been detected and corrected, resulting in potential damage to various system components. In contrast, by controlling the power supplied by the energy generating device in response to the braking signal as recited in claim 1, the power may be controlled proactively, to prevent such an over-voltage spike from occurring. (See e.g. page 4, line 26 to page 5, line 7 of applicant's specification, in contrast with the prior over-voltage detection systems described in the background section of applicant's specification at page 3, line 23 to page 4, line 21).

Gruenwald discloses a hybrid electric propulsion system for powering a vehicle using a natural fuel engine and an electric motor. Gruenwald discloses, as its preferred embodiment, an engine dominated, capacitor assisted, series hybrid vehicle. A series hybrid vehicle drive system 10 shown in Figure 1 includes an auxiliary power unit (APU) 12, an intelligent controller 14, a motor controller 16, a motor 18, and an energy storage system 20. In the preferred embodiment, the APU 12 includes a gas engine 26 driving a generator 28, and the energy storage system 20 includes an ultracapacitor bank, although alternative components for the APU and energy storage

system are also mentioned. The electric motor 18 is the only device of the system 10 that drives the wheel 30 in the preferred (series hybrid) embodiment, although a parallel hybrid embodiment is also disclosed. The motor 18 is used for both acceleration and deceleration via regenerative braking. The system electric bus is preferably connected to the ultracapacitor or energy storage system 20, so that the electric bus voltage equals the capacitor voltage. (See col. 4, lines 26-39 and 45-51; col. 4 line 66 – col. 5 line 3; col. 5 lines 44-54; col. 5 line 66-col. 6 line 13; col. 6 lines 59-61; and the Abstract of Gruenwald.)

In connection with claim 1, the Examiner has referred to Figure 5, and col. 8, line 6 of Gruenwald. For the Examiner's convenience, col. 8 lines 6-14 of Gruenwald are reproduced below:

> "When the operator signals a braking event, usually by pushing the brake pedal, a negative (reverse) torque signal is produced proportional to the deceleration desired. In this mode, the traction control/inverter [16, 17] reduces frequency to the motor [18] and develops a current proportional to the torque signal, up to the maximum rated for the motor [18] and inverter [17]. The voltage of the system will begin to rise as the capacitors [20] begin to store energy, and the APU/PPU [12] power is reduced to minimum." [emphasis added; reference numerals also added for the Examiner's convenience.]

Applicant respectfully submits that neither the above passage of Gruenwald, nor the Gruenwald reference in general, discloses "controlling power supplied by the energy generating device to the energy bus, in response to a braking signal indicative of user brake actuation", as recited in claim 1. Rather, Applicant respectfully submits that to the extent that Gruenwald discloses controlling power supplied by an energy generating device to an energy bus, it does so only in response to detected voltage conditions on the energy bus, and not in response to a braking signal as recited in claim 1.

In this regard, it appears that the Examiner has compared the APU 12 of Gruenwald to the "energy generating device" recited in claim 1, has compared the motor 18 of Gruenwald to the "regenerative braking system" recited in claim 1, and has compared the "negative (reverse) torque signal" of Gruenwald to the "braking signal" recited in claim 1. Without prejudice, for the purposes of the present response, Applicant does not take issue with these comparisons.

The first two sentences of the above passage of Gruenwald disclose reducing frequency to the motor 18, apparently in response to the negative (reverse) torque signal produced when a user pushes the brake pedal, however, the motor 18 does not correspond to the "energy generating device" of claim 1, but rather, appears to correspond to the "regenerative braking system" which is recited separately in claim 1. Thus, the first two of the three sentences in the above passage of Gruenwald do not disclose "controlling power supplied by the energy generating device" but rather, appear to relate to control of a component of a regenerative braking system.

The remaining sentence of the above passage, at col. 8 lines 12-14, states, "The voltage of the system will begin to rise as the capacitors [20] begin to store energy, and the APU/PPU [12] power is reduced to minimum." However, applicant respectfully submits that a closer inspection of Gruenwald reveals that the latter reduction in APU power does not occur "in response to a braking signal" as recited in claim 1, but rather, occurs in response to a detected voltage condition on the electric bus and the capacitors, namely, the rising voltage referred to in the first part of this sentence of Gruenwald. In this regard, Applicant respectfully notes that Gruenwald, shortly after the above passage, at col. 8 lines 45-48, notes that,

> "Figs. 6A-6B illustrate flowcharts depicting the power management process of a preferred embodiment of the present invention."

Fig. 6A of Gruenwald, in turn, shows an inquiry block labelled "Capacitor Voltage?", and if this voltage is at a "high voltage set point", the flowchart leads to a further block labelled "adjust generator to maintain high voltage set point". None of the various blocks in the power management process flowcharts in Figs. 6A-6B disclose controlling generator or APU output in response to a braking signal.

In addition to Figs. 6A-6B, Applicant respectfully submits that various other passages of Gruenwald support Applicant's conclusion that any control of APU energy output is strictly in response to a detected voltage condition on the electric bus, and not in response to a "braking signal" as recited in claim 1. For example, col. 3 at lines 40-44 states that,

> "the power management controller is adapted to decrease the output of the auxiliary power unit when the energy level of the energy storage system reaches the high threshold point of the range."

Col. 6 at lines 48-54 states,

> "It is also preferred that the power management system monitor and maintain the capacitor voltage level in a pre-determined range. For example, a proportional-integral (PI) control algorithm may be used to control the capacitor voltage within a predetermined range (225-400 volts). This is preferably accomplished by varying the power requested from the APU."

Col. 7 at lines 24-26 states,

> "As the high voltage set-point is reached, the generator control will reduce generator output to maintain the high voltage set-point; ... ."

Thus, when the passage in col. 8 to which the Examiner has referred is read in the context of the Gruenwald reference as a whole, Applicant respectfully

submits that the stated reduction in APU power does not occur "in response to a braking signal indicative of user brake actuation" as recited in claim 1. Rather, Gruenwald appears to allow the regenerative braking to commence and consequently allow the voltage on the bus and in the ultracapacitor bank to rise, and does not appear to reduce the APU output until a voltage condition on the electric bus is detected, namely, the "high voltage set-point" threshold disclosed in Gruenwald.

Thus, the Gruenwald reference appears to be a further example of the prior art referred to in the background section of Applicant's specification, in which power supplied by an energy-generating device is controlled in response to a detected voltage condition, disadvantageously leading to the possibility of brief over-voltage spikes before the over-voltage condition is detected and corrected.

In summary, Applicant respectfully submits that Gruenwald fails to disclose "controlling power supplied by the energy generating device to the energy bus, in response to a braking signal indicative of user brake actuation" as recited in claim 1, and therefore fails to satisfy the above-noted test for anticipation. Applicant therefore respectfully requests that the rejection of claim 1 under 35 U.S.C. § 102(e) be withdrawn.

Claims 2 – 10 and 23 are directly or indirectly dependent upon claim 1. Applicant therefore respectfully submits that these claims are allowable due to their dependencies, as well as the additional subject-matter that each of these claims recites. In view of the fact that it is unnecessary to comment upon such additional subject-matter of these claims in view of their dependencies, Applicant offers only the following remarks in relation to a selected one of these claims, for illustrative purposes only. Dependent claim 5 recites,

> "wherein controlling comprises commencing said controlling no later than a time at which the regenerative braking system of the vehicle commences supplying energy to the energy bus."

In contrast, the passage of Gruenwald to which the Examiner has referred, at col. 8 lines 6-14 (reproduced earlier herein) appears to state that in the Gruenwald system, the regenerative braking commences, and the motor 18 begins increasing the voltages across the capacitors, before the APU power is reduced. Thus, Gruenwald also fails to disclose the additional subject-matter of dependent claim 5.

Independent claim 24 recites:

24. An apparatus for supplying energy to an energy bus in communication with an energy generating device and with a regenerative braking system in a hybrid electric vehicle, the apparatus comprising a processor circuit configured to control power supplied by the energy generating device to the energy bus, in response to a braking signal indicative of user brake actuation.

Applicant respectfully submits that the Gruenwald reference fails to satisfy the requirements for a finding of anticipation of claim 24, for reasons including those presented above in connection with claim 1.

Claims 25 – 33 and 46 – 54 are directly or indirectly dependent upon claim 24. Applicant therefore respectfully submits that these claims are allowable due to their dependencies, as well as the additional subject-matter that each of these claims recites.

Independent claim 55 recites:

55. An apparatus for supplying energy to an energy bus in communication with energy generating means and with regenerative braking means in a hybrid electric vehicle, the apparatus comprising:

means for receiving a braking signal indicative of user brake actuation; and

means for controlling power supplied by the energy generating means to the energy bus, in response to the braking signal.

Applicant respectfully submits that the Gruenwald reference fails to satisfy the requirements for a finding of anticipation of claim 55, for reasons including those presented above in connection with claim 1.

Claims 56 – 62 and 69 – 73 are directly or indirectly dependent upon claim 55. Applicant therefore respectfully submits that these claims are allowable due to their dependencies, as well as the additional subject-matter that each of these claims recites.

Independent claims 74 and 75 recite:

74. A computer readable medium providing codes for directing a processor circuit to control power supplied by an energy generating device to an energy bus in communication with the energy generating device and with a regenerative braking system in a hybrid electric vehicle, in response to a braking signal indicative of user brake actuation.

75. A signal comprising code segments for directing a processor circuit to control power supplied by an energy generating device to an energy bus in communication with the energy generating device and with a regenerative braking system in a hybrid electric vehicle, in response to a braking signal indicative of user brake actuation.

Applicant respectfully submits that the Gruenwald reference fails to satisfy the requirements for a finding of anticipation of claims 74 and 75, for reasons including those presented above in connection with claim 1.

By the present amendment, independent claims 76, 84, 100 and 101 have been amended, to clarify that the limitations of these claims are in fact limitations, and not mere statements of intended use. Applicant respectfully submits that these amendments are neither narrowing nor are they for any substantial reason related to patentability, and Applicant respectfully submits that the Examiner has not raised any issue that would require the present amendments to these claims.

Amended claim 76 recites:

76. A method of supplying energy to an energy bus in a hybrid electric vehicle, the method comprising controlling energy contributions onto the energy bus from an energy generating device and from a regenerative braking system respectively, wherein controlling comprises preventing said contributions from exceeding a desired total energy contribution.

As discussed above in connection with claim 1, Gruenwald appears to disclose controlling various power management parameters in response to detected voltage conditions, such as the detection shown in Fig. 6A of the "capacitor voltage" being "at high voltage set point", or the detection shown in Fig. 10 of an "overvoltage trip", for example. In this regard, Gruenwald states at col. 6 lines 48-52 that,

> "It is also preferred that the power management system monitor and maintain the capacitor voltage level in a pre-determined range. For example, a proportional-integral (PI) control algorithm may be used to control the capacitor voltage within a predetermined range (225 – 400 volts)."

The Examiner will appreciate that no reactive system is capable of truly instantaneous response, with the result that any system such as Gruenwald that detects a "high voltage set point" being reached or exceeded and reacts

by reducing the voltage, will necessarily be susceptible to brief overvoltage spikes during the brief delay period between detection and correction, as discussed in the background section of applicant's specification. Accordingly, Gruenwald fails to disclose "preventing said contributions from exceeding a desired total energy contribution", as recited in claim 76. (In contrast, the preferred embodiment disclosed in Applicant's specification prevents the contributions from exceeding the desired total energy contribution by acting proactively to prevent an overvoltage condition from occurring, rather than reactively after such an overvoltage condition has already occurred.) Applicant therefore respectfully submits that the Gruenwald reference fails to satisfy the requirements for a finding of anticipation of claim 76, and respectfully requests that the rejection of claim 76 be withdrawn.

Claims 77 – 79 and 83 are directly or indirectly dependent upon claim 76. Applicant therefore respectfully submits that these claims are allowable due to their dependencies, as well as the additional subject-matter that each of these claims recites.

Amended independent claim 84 recites:

84. An apparatus for supplying energy to an energy bus in a hybrid electric vehicle, the apparatus comprising a processor circuit configured to control energy contributions onto the energy bus from an energy generating device and from a regenerative braking system respectively, wherein said processor circuit is configured to prevent said contributions from exceeding a desired total energy contribution.

Applicant respectfully submits that the Gruenwald reference fails to satisfy the requirements for a finding of anticipation of claim 84, for reasons including those presented above in connection with claim 76.

Claims 85 – 87 and 91 are directly or indirectly dependent upon claim 84. Applicant therefore respectfully submits that these claims are allowable due to

their dependencies, as well as the additional subject-matter that each of these claims recites.

Independent claim 92 recites:

92. An apparatus for supplying energy to an energy bus in a hybrid electric vehicle, the apparatus comprising:

first means for controlling a first energy contribution onto the energy bus from energy generating means; and

second means for controlling a second energy contribution onto the energy bus from regenerative braking means,

wherein said first and second means for controlling cooperate to prevent said contributions from exceeding a desired total energy contribution.

Applicant respectfully submits that the Gruenwald reference fails to satisfy the requirements for a finding of anticipation of claim 92, for reasons including those presented above in connection with claim 76.

Claims 93 – 95 and 99 are directly or indirectly dependent upon claim 92. Applicant therefore respectfully submits that these claims are allowable due to their dependencies, as well as the additional subject-matter that each of these claims recites.

Amended independent claims 100 and 101 recite:

100. A computer readable medium providing codes for directing a processor circuit to control energy contributions onto an energy bus in a hybrid electric vehicle from an energy generating device and from a regenerative braking system respectively, wherein said codes direct said processor circuit to prevent said contributions from exceeding a desired total energy contribution.

101. A signal comprising code segments for directing a processor circuit to control energy contributions onto an energy bus in a hybrid electric vehicle from an energy generating device and from a regenerative braking system respectively, wherein said code segments direct said processor circuit to prevent said contributions from exceeding a desired total energy contribution.

Applicant respectfully submits that the Gruenwald reference fails to satisfy the requirements for a finding of anticipation of claims 100 and 101, for reasons including those presented above in connection with claim 76.

35 U.S.C. § 103(a)

The Examiner has expressed the view that claims 11 – 22, 34 – 45, 63 – 68, 80 – 82, 88 – 90 and 96 – 98 are unpatentable over Gruenwald in view of U.S. Patent No. 5,511,859 to Kade et al. ("Kade").

Claims 11 – 22 are directly or indirectly dependent upon independent claim 1. Claims 34 – 45 are directly or indirectly dependent upon independent claim 24. Claims 63 – 68 are directly or indirectly dependent upon independent claim 55. Claims 80 – 82 are directly or indirectly dependent upon independent claim 76. Claims 88 – 90 are directly or indirectly dependent upon independent claim 84. Claims 96 – 98 are directly or indirectly dependent upon independent claim 92. As independent claims 1, 24, 55, 76, 84 and 92 have been shown to be allowable under the previous heading, Applicant respectfully submits that claims 11 – 22, 34 – 45, 63 – 68, 80 – 82, 88 – 90 and 96 – 98 are allowable due to their dependencies as well as the additional subject-matter that each of these claims recites.

Conclusion

In view of the foregoing, Applicant respectfully submits that the present application is in condition for allowance, and respectfully requests that a Notice of Allowance be issued.

Respectfully submitted,

Dowell & Dowell, P.C.
Ralph A. Dowell
Reg. No. 26,868

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Dowell & Dowell, P.C.
1215 Jefferson Davis Hwy
Suite 309
Arlington, Va. 22202
703-415-2555

SJF:NPT:cat